

LABORATORY

AMINO ACID SEQUENCE IN A PROTEIN

Objective

To determine the amino acid sequence of a small protein.

Background Information

Enzymes are proteins. In order to carry on their very specific functions, the sequence of the amino acids in their structure must be precise. The DNA in the chromosomes of cells, through its own order of bases, is the determining factor in the amino acid sequence. Ribosomes, messenger RNA, and transfer RNA are involved in the formation of the final protein molecule. In DNA, a specific grouping of three bases (triplet code) represents a specific amino acid. Through mRNA (codons) and tRNA (anticodons), we can determine the structure of a protein.

Materials

paper
pencil
table of codons
Nelson Biology, page 637

Procedure

- 1 Examine the following segment from one side of a DNA molecule. Read the bases from left to right.
T-A-C-A-C-A-C-G-G-A-A-T-G-G-G-T-A-A-A-A-A-C-T

- 2 Determine the sequence for the messenger RNA that corresponds to the given DNA structure.
 - a) Draw the sequence. Are there any differences between the DNA and mRNA segments in terms of chemical organization? Explain.
- 3 From left to right divide up the mRNA into consecutive groups of three bases. These are called codons.
 - b) List the codons in sequence in a column in your lab note book.
- 4 Refer to the table of messenger RNA codons. Beside each of your listed codons, write the appropriate codon information.
 - c) Record the precise amino acid sequence of the protein molecule.

Application Questions

- 1 Do all of the codons on the messenger RNA represent specific amino acids? Explain.
- 2 If the original DNA strand in this investigation had been complementary to the one given, would the same protein molecule have been produced? Explain.
- 3 Explain what would have occurred to your protein molecule if:
 - a) the fourth base (adenine) in the original DNA strand had been thymine?
 - b) the seventh base (cytosine) in the original DNA strand was deleted due to mutation?
- 4 Indicate the tRNA anticodon for the second DNA triplet code in the original DNA molecule.
- 5 Describe the role of the first and last triplet codes in the original DNA molecule. ■